

REMARKS

Claims 53-59 are pending in the application. In the Office Action dated January 7, 2004, the Examiner took the following action: (1) objected to the disclosure; (2) rejected claim 53 under 35 U.S.C. § 112 as based on a disclosure which is not enabling; (3) rejected claims 53-59 under 35 U.S.C. § 112 as failing to distinctly claim the subject matter; and (4) rejected claims 53-59 under 35 U.S.C. § 103(a) as being unpatentable over Bruxvoort et al. (5,958,794).

Applicants disagree with these rejections and wish to clarify various distinctions of applicants' invention over the cited art. Reconsideration of the invention is therefore requested in light of the following remarks.

In the remarks that follow, various technical differences between the references cited by the Examiner and the embodiments of the present invention are discussed. It is understood, however, that any discussion involving various embodiments of the invention, which are disclosed in detail in the applicants' specification, do not define the scope or interpretation of any of the claims. Moreover, any discussion of differences between the references cited and the various embodiments of the invention are intended only to help the Examiner to appreciate the importance of the claimed distinctions as they are discussed.

Applicants' Teaching

The disclosed embodiments of the invention will now be discussed in comparison to the applied references. Of course, the discussion of the disclosed embodiments, and the discussion of the differences between the disclosed embodiments and the subject matter described in the applied references, does not define the scope or interpretation of any of the claims. Instead, such discussed differences merely help the Examiner appreciate important claim distinctions discussed thereafter.

The invention disclosed in the application is directed to planarizing microelectronic substrate assemblies on fixed abrasive polishing pads with non-abrasive planarizing solutions. In one aspect of the invention, a lubricating planarizing solution without abrasive particles is deposited onto a fixed-abrasive polishing pad having a body, a planarizing surface on the body, and a plurality of abrasive particles fixedly attached to the body at the planarizing surface. The front face of a substrate is pressed against the lubricating planarizing

solution and at least a portion of the planarizing surface of the polishing pad. At least one of the polishing pad or the substrate assembly is then moved with respect to the other to impart relative motion therebetween. As the substrate assembly moves relative to the polishing pad, regions of the front face are separated from the abrasive particles in the polishing pad by a lubricant-additive in the planarizing solution.

In one particular application, regions of the front face of the substrate are separated from the abrasive particles by dissolving the lubricant-additive into a non-abrasive solution to form the lubricating planarizing solution, and then depositing the lubricating planarizing fluid onto the polishing pad as the substrate moves relative to the polishing pad. The particular lubricants found to be most suitable for planarization are glycerol, polyethylene glycol, polypropylene glycol, CARBOPOL® (manufactured by B.F. Goodrich), polyvinyl alcohol, POLYOX® (manufactured by Union Carbide), or some other lubricating liquid. The concentration of the lubricant-additive in the non-abrasive solution is selected so that the lubricating planarizing solution has a viscosity of at least approximately 4-100 cp, and more generally 10-20 cp. The lubricating planarizing solution provides a protective boundary layer between the front face of the substrate and the abrasive planarizing surface to inhibit the fixed abrasive from overly abrading or otherwise damaging the substrate.

The cited art

Bruxvoort does not disclose all the species of lubricants that Applicants disclose.

The section of Bruxvoort at column 13 cited by the Examiner states:

Examples of suitable lubricants include metal salts of fatty acids (e.g., zinc stearate, calcium stearate and lithium stearate), graphite, mica, molybdenum disulfide, talc, polyamides, boron nitride, sulfides, waxes, glycol ethers, glycerine, silicone compounds, polyvinyl acetate, polyvinyl alcohols, ethylene oxide polymers (e.g., polymers commercially available under the trade designation "Polyox" from Union Carbide Corp.), combinations thereof and the like. (col 13, lines 23-30).

The Examiner is requested to note that glycerol, CARBOPOL®, polyethylene glycol and polypropylene glycol are absent from this list. With respect to glycerol, which is a 3-carbon poly-ol with a hydroxy group on each carbon, there is not even a genus term in the list that would include any species of poly-ols. The same is true for polypropylene glycol, which is a propylene

oxide polymer with hydroxy termini. There is also no genus term that would include CARBOPOL®, which was described by the manufacturer at the time the application was filed as “high molecular weight homo- and copolymers of acrylic acid crosslinked with a polyalkenyl polyether.” Accordingly, Bruxvoort is deficient at least because it fails to teach these components used by Applicants.

It is acknowledged that Bruxvoort mentions polyvinyl alcohol, and that the terms POLYOX and “ethylene oxide polymers” mentioned by Bruxvoort is a genus that would include polyethylene glycol. With respect to polyethylene glycol, however, it is well established that a genus does not anticipate nor render obvious a species, therefore Bruxvoort’s references to POLYOX and ethylene oxide polymers does not render Applicants’ use of polyethylene glycol obvious.

In addition, Applicants submit that Bruxvoort provides no teaching that would make it obvious to one of ordinary skill in the art to select polyvinyl alcohol over any other lubricant from the laundry list of lubricants disclosed therein. Based on the teaching of Bruxvoort, why for example, would one choose polyvinyl alcohol instead of stearate, or graphite, or boron nitride, or mica, or molybdenum disulfide, all of which are vastly different chemical compounds with vastly different properties? Without a specific teaching as to why one would or should select one compound over another, there is nothing in Bruxvoort that would motivate one of ordinary skill in the art to particularly use polyvinyl alcohol. At best, the Bruxvoort laundry list amounts to an “invitation to try” or an “invitation to experiment” with a large and diverse category of possible compositions. Such an invitation to experiment without a specific teaching or guidance as to what to achieve has been held insufficient to establish a *prima facie* case of obviousness.

In this regard, Applicants disagree with the Examiner's position that one of ordinary skill in the art would have found it obvious, based on Bruxvoort, to perform experiments using various compositions with various viscosities in order to reduce friction between the fixed abrasive article and semiconductor wafer surface during the planarization process. Based on Bruxvoort alone, without reference to Applicants’ teaching why would one particularly choose to experiment with the viscosities in a planarizing solution? Bruxvoort provides no teaching or suggestion that viscosity is an issue to consider. As mentioned above,

Bruxvoort provides no guidance on what compounds to select, nor any guidance as to the amounts or properties that are important for lubrication during chemical mechanical planarization. It is Applicants that recognize that viscosity is an important property in lubrication during CMP and it is Applicants who provide the needed guidance to make effective planarizing solutions that combine ammonia and water specifically with the lubricants POLYOX®, glycerol, polyethylene glycol, polypropylene glycol, polyvinyl alcohol, or CARBOGEL to achieve compositions of particular viscosities.

The Claims and Rejections

Turning now to the claims and the rejections thereof, claim 53 has been amended to specifically recite a markush group of lubricants. The list includes the species glycerol, polyethylene glycol, polypropylene glycol and CARBOGEL, which are not disclosed by Bruxvoort. Although Bruxvoort discloses POLYOX, among a laundry list of potential lubricants, the reference provides no guidance that would motivate the skilled person to particularly select POLYOX nor provides any teaching that viscosity is an important parameter to optimize. At best, Bruxvoort provides an invitation to experiment. Accordingly, withdrawal of the rejection of the claims based on obviousness is respectfully requested.

With respect to the rejections under § 112, second paragraph, amended claim 53 recites particular species of lubricants so that the claims now recite particular compositions that enable the invention.

With respect to the rejections for use of the trademark names POLYOX® and CARBOGEL®, the specification has been amended to recite the chemical compositions of these products pertinent to the invention as known at the time the application was filed. The chemical compositions of these products is therefore clear from the specification. Accordingly, withdrawal of the rejection of the claims on this ground is respectfully requested. In addition, Applicants have amended the specification and claims to change the typographical error in the name CARBOGEL®, to the correct name CARBOPOL®. This does not introduce any new matter because the error is based on an initial typographical error that was carried through the entire specification and overlooked during review. Applicants are not aware of any product by the named CARBOGEL®, and in fact, CARBOPOL® is what was used.

With respect to the rejection of claim 53 under § 112, second paragraph, for reciting "greater than" and "approximately," Applicants traverse the Examiner's statement that these are different ranges rendering the claim indefinite. The term "approximately" refers to the lower value of 4 cp, whereas the term "greater than" refers to the range. The term "approximately" means that the lower enabling value is not limited to exactly 4 cp because the precision and accuracy of typical volumetric measuring tools varies as does the ability to read between demarcations on the same. Accordingly, withdrawal of the rejection on this ground is respectfully requested.

With respect to the priority claim, Applicants have amended the specification to recite a change in status of the priority application to a granted patent. The preliminary amendment filed with the present application correctly claimed priority and the relationship to the priority application by application number only.

All of the claims remaining in the application are now clearly allowable. Favorable consideration and a timely Notice of Allowance are earnestly solicited.

Respectfully submitted,

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Fee Transmittal Sheet (+ copy)

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